

Markus Glaß: Scratch Assay Analysis in ImageJ

Abstract

Scratch assays are a widely used tool for assessing the migratory potential of cells. However, due to a lack of appropriate tools these assays are often analyzed manually. Here, we present a plugin for the automatic segmentation and analysis of scratch assay images.

The input images are segmented using a topology-preserving non-PDE level set approach. Prior to segmenting the images are smoothed using a Gaussian filter, and subsequently the local entropy is computed as the feature used for segmentation. This method, by design, always yields one scratch segment but there may also be images where the scratch has already been completely closed. To cope with these cases, a classification step applying a support vector machine follows the segmentation. The features used for classification are derived from the intensity histograms of the previously segmented regions.

The plugin can analyze a single image or all images in a given directory in batch mode. The user can define the window size for the local entropy calculation, the size of the Gaussian filter and the orientation of the scratch (vertical or horizontal). If the default parameters of the SVM are not adequate for a data set, the plugin offers the possibility to either train the SVM on own training data or to disable classification and manually exclude images with completely closed scratches. Results are presented in form of segmented binary images and a table containing the scratch areas measured as well as absolute and, if used in batch mode, relative differences with regard to a reference image.

The plugin is implemented as part of MiToBo (<http://www.informatik.uni-halle.de/mitobo>), an extension for ImageJ, offering several operators for analysing microscopic data. As a part of MiToBo the plugin features an online help, which gives details on parameters and additional information directly from within ImageJ, and it allows for automatic documentation of the processing pipeline. As our method requires adjustment of only two parameters, it is easy to use and has already been successfully applied in practice.

Keywords

Scratch assay, Level sets, SVM, Entropy, Topology preservation

Short CV

Markus Glaß received his Diploma in Bioinformatics (Dipl.-Bioinf.) from the Martin Luther University Halle-Wittenberg, Germany, in 2010. He currently works as a PhD student at the Institute for Molecular Medicine and the Institute of Computer Science at the Martin Luther University. Research interests include live cell imaging, image processing and computer vision.

Administrative data

Presenting author: Markus Glaß

Organisation: Institute of Computer Science, Martin Luther University Halle-Wittenberg

co-authors: Birgit Moeller, Stefan Posch

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